DEVICE OF HUMIDIFYING SYSTEM FOR FUEL CELL

Publication number: JP6119931
Publication date: 1994-04-28
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Applicant: MITSUBISHI HEAVY IND LTD
Classification:
- International: ***H01M8/04; H01M8/10;*** **H01M8/04; H01M8/10;** (IPC1-7): H01M8/04; H01M8/10
- European: H01M8/04C2E
Application number: JP19920264760 19921002
Priority number(s): JP19920264760 19921002

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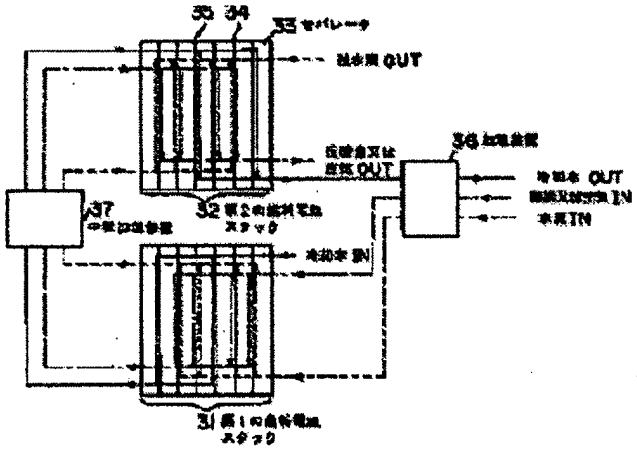
Abstract of **JP6119931**

PURPOSE:To maintain the water retaining condition of a high-polymer ion exchange film as an electrolyte and facilitate uniform distribution of hydrogen in each stack. CONSTITUTION:A fuel cell humidifying system device has solid high-polymer electrolyte fuel cell stacks 31, 32 split in a plurality of fragments and humidifying devices 36, 37 located upstream of the stackes 31, 32 to humidify the fuel hydrogen, wherein the stacks 31, 32 are connected with the humidifying devices 36, 37, and humidification takes place little by little in the course of the fuel hydrogen being consumed.



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(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（A）**　(11)特許出願公開番号

特開平6－119931

(43)公開日　平成６年(1994)４月28日

(51)Int.Cl.[5]		識別記号	庁内整理番号	Ｆ Ｉ	技術表示箇所
Ｈ０１Ｍ	8/04	Ｊ			
	8/10		8821－4K		

審査請求　未請求　請求項の数１(全 8 頁)

(21)出願番号　特願平4－264760

(22)出願日　平成４年(1992)10月２日

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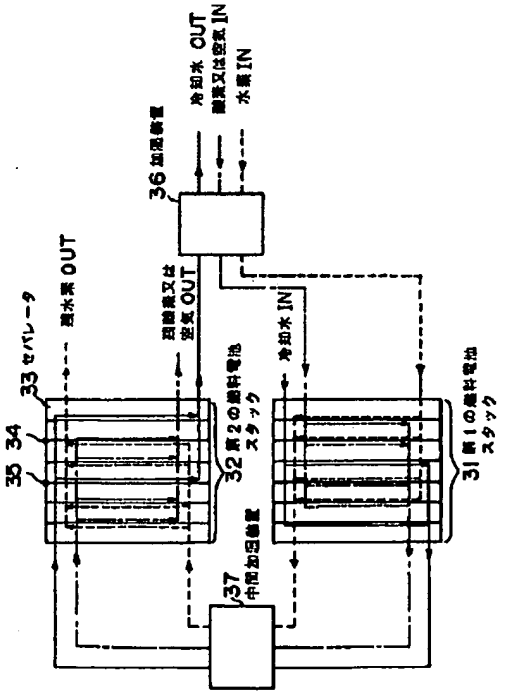
(54)【発明の名称】　燃料電池の加湿システム装置

(57)【要約】
【目的】この発明は、電解質である高分子イオン交換膜の保水状態を維持できるとともに、水素の各スタックでの均等分配を容易に行なえることを主要な目的とする。
【構成】複数に分割された固体高分子電解質燃料電池スタック(31,32)と、前記各スタック(31,32)の上流側に設けられ、燃料水素を加湿する加湿装置(36,37)とを有し、前記各スタック(31,32)と複数の加湿装置(36,37)とを接続して燃料水素が消費されていく過程の中で逐次加湿していくことを特徴とする燃料電池の加湿システム装置。



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【特許請求の範囲】

【請求項1】　複数に分割された固体高分子電解質燃料電池スタックと、前記各スタックの上流側に設けられ、燃料水素を加湿する加湿装置とを有し、前記各スタックと複数の加湿装置とを接続して燃料水素が消費されていく過程の中で逐次加湿していくことを特徴とする燃料電池の加湿システム装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、固体高分子電解質燃料電池の燃料電池スタックと加湿装置とからなる燃料電池の加湿システム装置に関する。

【0002】

【従来の技術】周知の如く、固体高分子電解質燃料電池の発電原理は図1に示す通りである。電極接合体1は、電解質（高分子イオン交換膜）2としてフッ素樹脂系の高分子イオン交換膜（例えば、スルホン酸基を持つフッ素樹脂系イオン交換膜）を用い、これを中央にして両面に例えば白金からなる触媒電極（負極）3，触媒電極（陽極）4を付着させ、更にその両面をポーラスなカーボン電極（負極）5，カーボン電極（陽極）6でサンドイッチ状に挟み重ねた構成となっている。

【0003】セパレータ7の流通溝により燃料電池本体内に導入される水素は、電解質2である高分子イオン交換膜の水素イオン透過性を持たせるために、通常、導入前に燃料電池の運転温度付近における飽和水蒸気分圧相当の水蒸気を含有させ、即ち加湿させて導入される。酸素又は空気についても、同様の理由から加湿させることがある。

【0004】電極接合体1に供給された水素は、触媒電極（負極）3上で水素イオン化され、水素イオンは電解質2中で$H^+ \cdot xH_2O$として触媒電極（陽極）4側へ向って移動する。この時、水素イオンはx個のH_2Oを伴って負極から陽極へ移動するため、水素と共に導入された水蒸気は水素の流路方向に沿って徐々に陽極側へ透過し乾きガスに近づいていくことになる。

【0005】カーボン電極（陽極）6へ達した水素イオンは、酸化剤として同じく電池本体内に導入された酸素と反応して水を生成し、未反応酸素と共に排出される。同様に、水素イオン化されなかった未反応水素も燃料電池本体から排出される。

【0006】また、従来の固体高分子電解質燃料電池の加湿システム装置は、図2に示す通りである。同図は、燃料である水素、酸化剤である酸素（又は空気）、両者を加湿して燃料電池へ導入した例を示す。ここで、加湿水源としては、燃料電池の排熱を回収し、温水となった冷却水を用いている。燃料電池スタック11へ導入される水素、酸素（又は空気）は加湿装置12で燃料電池運転温度付近の飽和水蒸気分圧相当の水蒸気を含有、即ち加湿させられる。加湿させられた水素、酸素（又は空気）

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は、燃料電池スタック11内のすべての電極接合体挿入面13へセパレータ14の流路溝を通じて分配されるようになっている。なお、図中の15は、冷却水面を示す。

【0007】

【発明が解決しようとする課題】しかしながら、従来の加湿システム装置は以下の課題を有する。

【0008】(1) 燃料となる水素の加湿を燃料電池へ導入する入口でのみ行なうため、燃料電池内へ導入される水蒸気量が、加湿温度における飽和水蒸気分圧相当の水蒸気量に限定されてしまう。従って、電解質面積あるいは電極接合体面積を大きくしようとする場合、水素を加湿していた水蒸気は$H^+ \cdot xH_2O$の形で徐々に酸素又は空気側に透過し、水素の流路溝終末近傍では水蒸気圧が低くなって乾きガスに近づき、電解質である高分子イオン交換膜の保水状態を維持できなくなる。

【0009】(2) 燃料である水素が一度に全電極接合体に分配供給されるため、電極接合体へ供給される水素のガス流速が極めて小さくなり、電極接合体面数が多い場合、流量分配を均等にすることが極めて困難である。

【0010】この発明はこうした事情を考慮してなされたもので、電解質である高分子イオン交換膜の保水状態を維持できるとともに、電極接合体へ供給される水素のガス流速を大きくして水素の各スタックでの均等分配を容易に行なえる燃料電池の加湿システム装置を提供することを目的とする。

【0011】

【課題を解決するための手段】この発明は、複数に分割された固体高分子電解質燃料電池スタックと、前記各スタックの上流側に設けられ、燃料水素を加湿する加湿装置とを有し、前記各スタックと複数の加湿装置とを接続して燃料水素が消費されていく過程の中で逐次加湿していくことを特徴とする燃料電池の加湿システム装置である。

【0012】図3は、この発明に係る燃料電池の加湿システム装置の概略構成図を示す。図中の21，22，23は複数に分割された燃料電池スタックであり、これらの燃料電池スタック21～23の上流側には各スタック21～23へ導入される燃料水素を逐次加湿できるよう加湿装置24，加湿装置（中間）25，26が夫々配置されている。なお、酸化剤である酸素又は空気も必要に応じ加湿することもある。ここで、加湿装置24～26の湿水源としては、各スタックの排冷却水を逐次利用する全スタックを冷却し終った排冷却水を利用することが考えられる。

【0013】

【作用】上記の構成において、固体高分子電解質燃料電池のスタックを分割し、あるいは直列に接続し、各スタックへ燃料を水素を逐次加湿しながら導入することにより、

【0014】(1) 電解質である高分子イオン膜を$H^+ \cdot xH_2O$の形で透過する水蒸気分を常に補うことが可能

となり、水素のセパレータ上の流路溝終末近傍で水蒸気圧が確保できる。即ち、電解質である高分子イオン交換膜の保水状態を維持できるようになる。

【0015】(2) 各電極接合体に分配供給されるガス流速を分配数が少なくことで大きく採ることが可能となり、水素の各スタックでの均等分配が容易に行なえるようになる。

【0016】

【実施例】以下、この発明の一実施例を図面を参照して説明する。いずれの実施例の場合も、固体高分子電解質燃料電池スタックを分割あるいは直列に燃料である水素ラインを接続し、各スタック上流に加湿装置を設けた例を示す。

(実施例1)

【0017】図4を参照する。図中の31は第1の燃料電池スタックを示し、32は第2の燃料電池スタックを示す。これら燃料電池スタックは積層された複数のセパレータ33を有し、34は電極接合体挿入面を示し、35は冷却水面を示す。前記第1の燃料電池スタック31の上流側には加湿装置36が配置され、第2の燃料電池スタック32の上流側には中間加湿装置37が配置されている。

【0018】こうした構成の燃料電池の加湿システム装置において、第1の燃料電池スタック31に供給される水素及び酸素（又は空気）は、第2の燃料電池スタック32より排出される湿水となった冷却水により加湿され、第1の燃料電池スタック31に導入される。更に、第1の燃料電池スタック31より排出される残った水素及び酸素（又は空気）は、第1の燃料電池スタック31より排出される湿水となった冷却水により加湿され、第2の燃料電池スタック32に導入される。

(実施例2) 図5を参照する。但し、図4と同部材は同符号を付して説明を省略する。

【0019】第1の燃料電池スタック31に供給される水素及び酸素（又は空気）は、第1の燃料電池スタック31及び第2の燃料電池スタック32を冷却し排出される湿水となった冷却水により加湿され、第1の燃料電池スタック31に導入される。更に、第1の燃料電池スタック31より排出される残った水素及び酸素（又は空気）は、第1の燃料電池スタック31及び第2の燃料電池スタック32を冷却し排出される湿水となった冷却水により加湿され、第2の燃料電池スタック32に導入される。

(実施例3) 図6を参照する。但し、図4と同部材は同符号を付して説明を省略する。この実施例3は、図4において酸化剤である酸素又は空気を各スタックに初めから分岐して供給するようにしたことを要旨とする。

(実施例4) 図7を参照する。但し、図4と同部材は同符号を付して説明を省略する。この実施例4は、図5において酸化剤である酸素又は空気を各スタックに初めから分岐して供給するようにしたことを要旨とする。

【0020】このように、上記実施例によれば、第1燃料電池スタック31，第2の燃料電池スタック32を分割、あるいは直列に接続し、燃料である水素のラインの各スタックの上流側に加湿装置36，中間加湿装置37を設けることにより、以下に述べる利点を有する。

【0021】(1) 電解質である高分子イオン交換膜を透過して酸素又は空気側へ移動してしまう水蒸気を、各加湿装置36で補うことが可能となる。従って、高分子イオン交換膜をセパレータ上の水素流路溝に沿って全域にわたり十分なる保水状態に維持することができる。

【0022】(2) 各電極接合体への分配数が少なくなるため、セパレータ上の水素流路溝内の水素ガス流束を大きく取ることが可能となる。従って、水素の各スタック内における電極接合体への均等分配を行ないやすくなる。

【0023】

【発明の効果】以上詳述したようにこの発明によれば、電解質である高分子イオン交換膜の保水状態を維持できるとともに、電極接合体へ供給される水素のガス流速を大きくして水素の各スタックでの均等分配を容易に行なえる燃料電池の加湿システム装置を提供できる。

【図面の簡単な説明】

【図1】固体高分子電解質燃料電池の発電原理を示す説明図。

【図2】従来の燃料電池の加湿システム装置の説明図。

【図3】この発明に係る燃料電池の加湿システム装置の概略構成図。

【図4】この発明の実施例1に係る燃料電池の加湿システム装置の説明図。

【図5】この発明の実施例2に係る燃料電池の加湿システム装置の説明図。

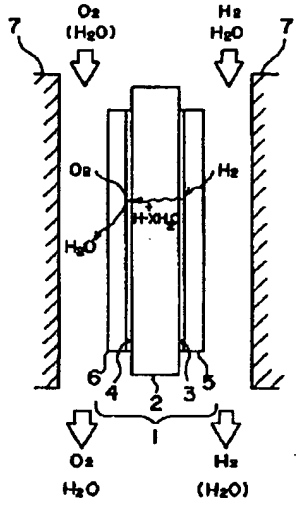
【図6】この発明の実施例3に係る燃料電池の加湿システム装置の説明図。

【図7】この発明の実施例4に係る燃料電池の加湿システム装置の説明図。

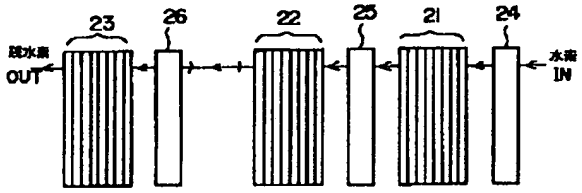
【符号の説明】

31…第1の燃料電池スタック、　32…第2の燃料電池スタック、33…セパレータ、
36…加湿装置、37…中間加湿装置。

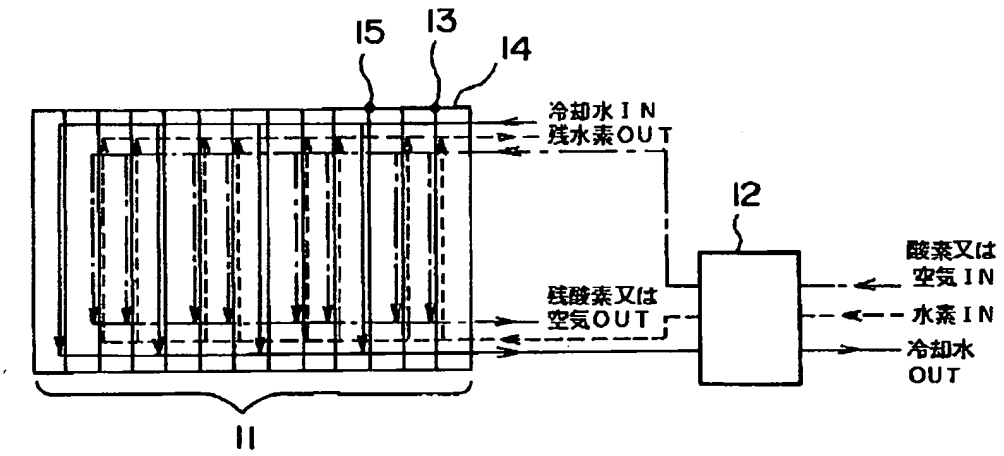
【図1】


7
O₂
(H₂O)
H₂
H₂O
7
O₂
H₂
H₂O
6
4
2
3
5
1
O₂
H₂O
H₂
(H₂O)

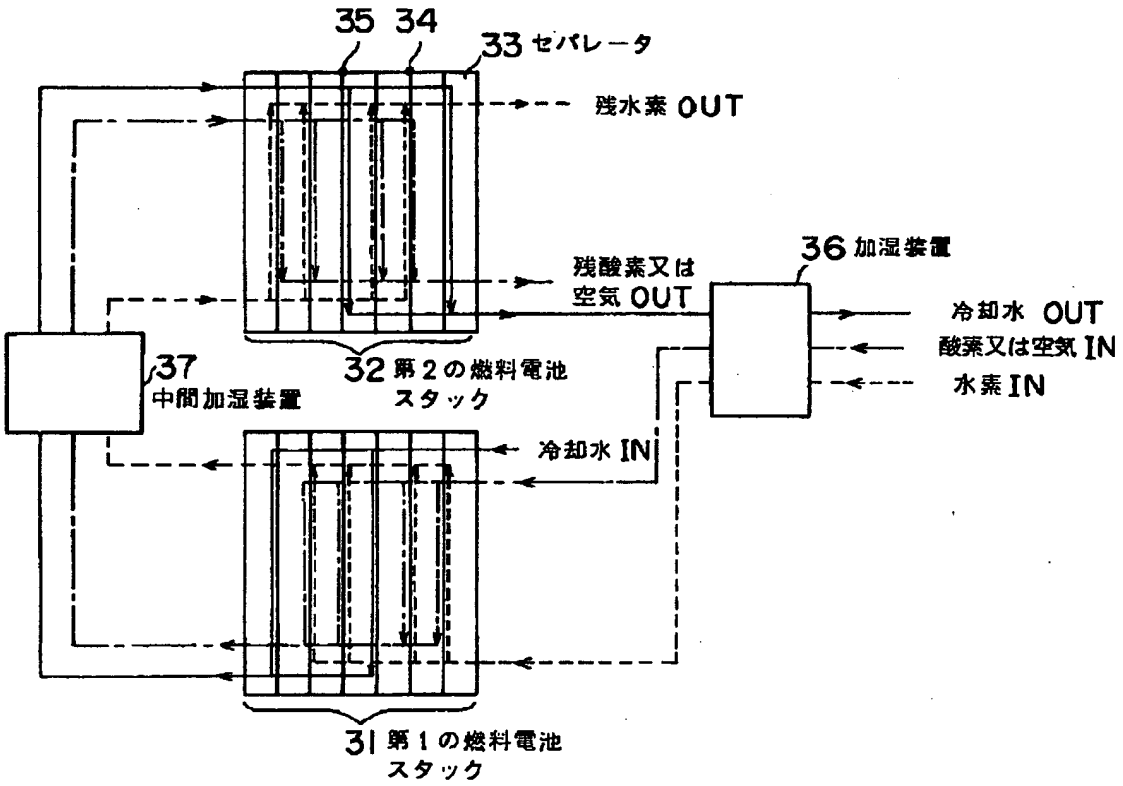
【図3】


23
26
22
25
21
24
残水素
OUT
水素
IN

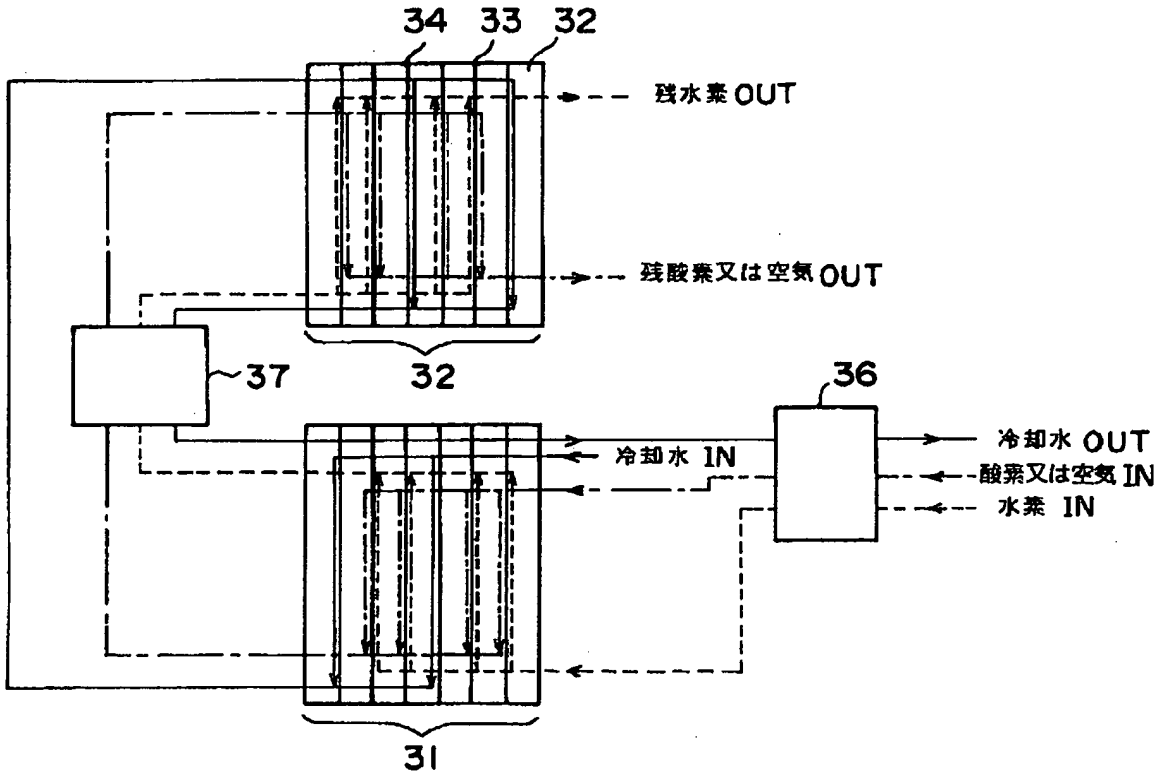
【図2】


15
13
14
冷却水ＩＮ
残水素ＯＵＴ
12
酸素又は
空気ＩＮ
残酸素又は
空気ＯＵＴ
水素ＩＮ
冷却水
ＯＵＴ
11

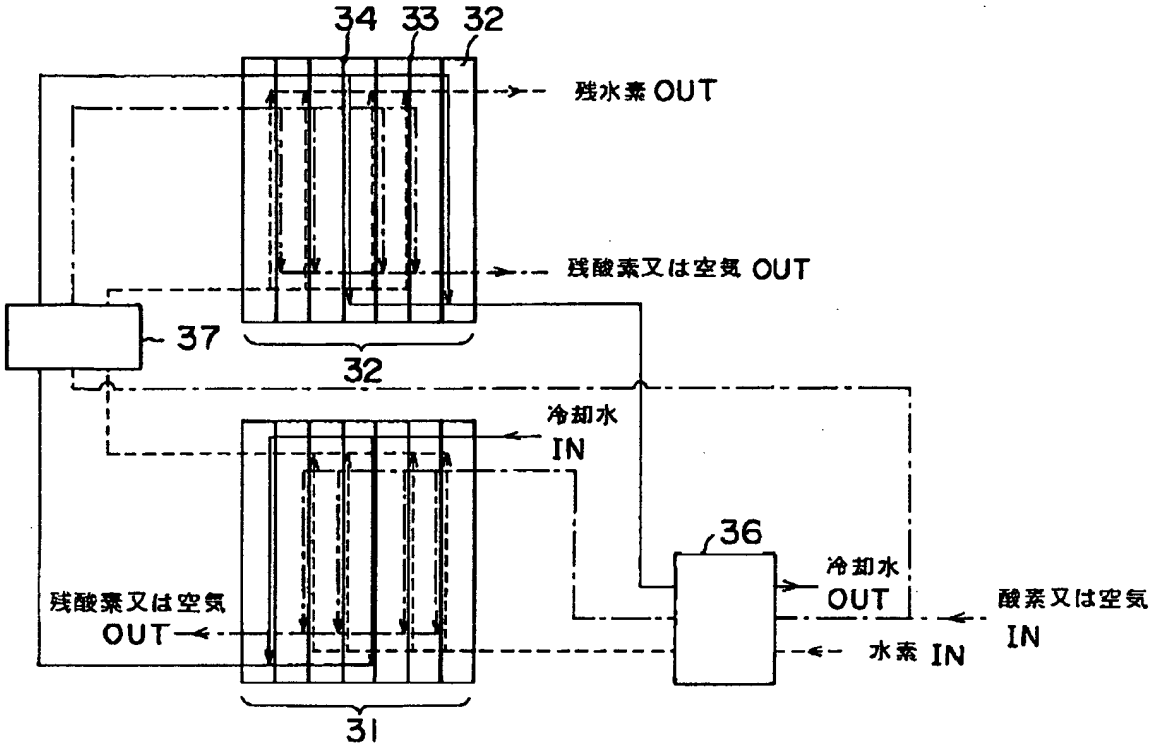
【図4】


35
34
33 セパレータ
残水素 OUT
残酸素又は
空気 OUT
36 加湿装置
冷却水 OUT
酸素又は空気 IN
水素 IN
37
中間加湿装置
32 第2の燃料電池
スタック
冷却水 IN
31 第1の燃料電池
スタック

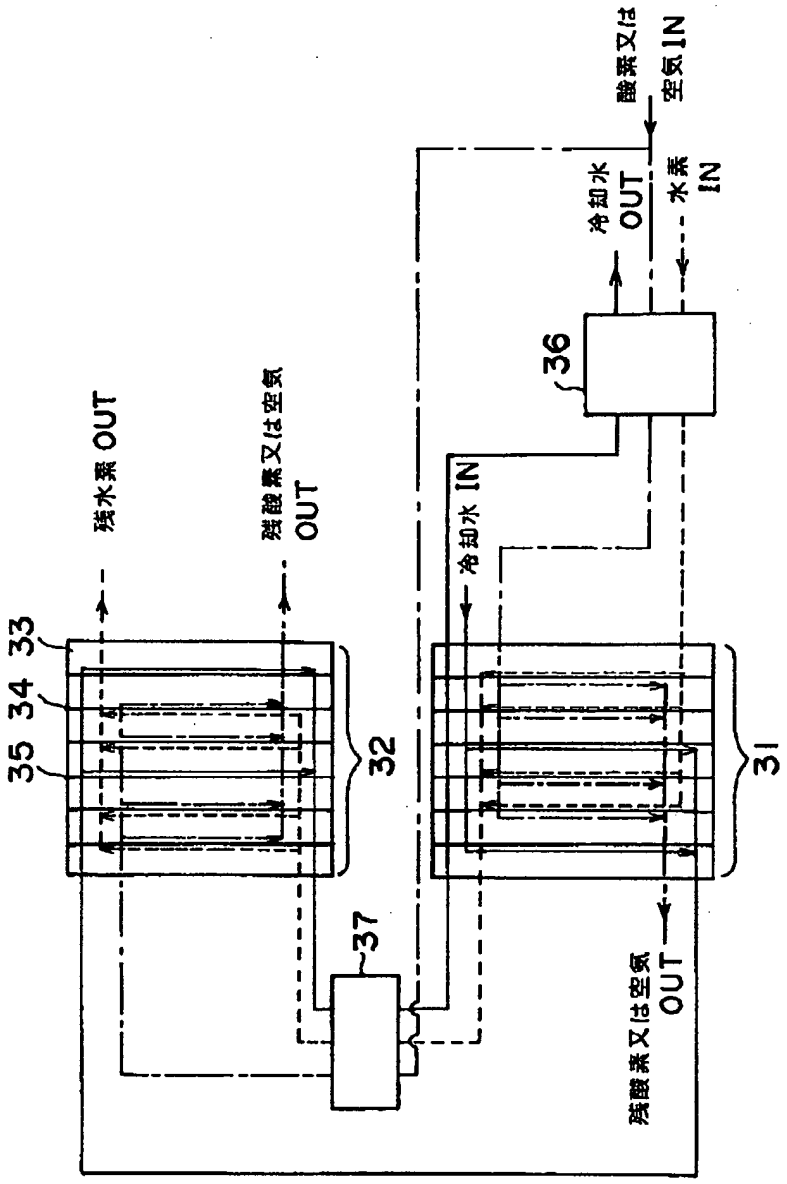
【図5】


34
33
32
残水素 OUT
残酸素又は空気 OUT
37
32
36
冷却水 IN
冷却水 OUT
酸素又は空気 IN
水素 IN
31

【図6】


34
33
32
残水素 OUT
残酸素又は空気 OUT
37
32
冷却水
IN
36
冷却水
OUT
酸素又は空気
IN
残酸素又は空気
OUT
水素 IN
31

【図7】


酸素又は
空気IN
冷却水
OUT
水素
IN
36
残水素 OUT
残酸素又は空気
OUT
冷却水 IN
33
34
35
32
31
37
残酸素又は空気
OUT

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CLAIMS

[Claim(s)]
[Claim 1]A humidifying system device of a fuel cell humidifying one by one in a process in which have the following, connect said each stack and two or more humidifying devices, and fuel hydrogen is consumed.
A solid polymer electrolyte fuel cell stack divided into plurality.
A humidifying device which is formed in the upstream of each of said stack and humidifies fuel hydrogen.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the humidifying system device of the fuel cell which consists of the fuel cell stack and humidifying device of a solid polymer electrolyte fuel cell.
[0002]
[Description of the Prior Art]Like common knowledge, the power generation principle of a solid polymer electrolyte fuel cell is as being shown in drawing 1. The electrode conjugate 1 as the electrolyte (polymers ion-exchange membrane) 2 The polymers ion-exchange membrane of a fluoro-resin system. (For example, a fluoro-resin system ion-exchange membrane with a sulfonic group) is used, Carry out this in the center, the catalyzer electrode (negative electrode) 3 and the catalyzer electrode (anode) 4 which consist of platinum are made to adhere to both sides, and it has composition further repeated to sandwich shape across the both sides with the PORASU carbon electrodes (negative electrode) 5 and the carbon electrodes (anode) 6.
[0003]In order to give the hydrogen ion permeability of the polymers ion-exchange membrane which is the electrolyte 2, the hydrogen introduced by the circulating groove of the separator 7 in a fuel cell body makes the steam of the saturated steam partial pressure in near the operating temperature of a fuel cell contain before introduction, namely, is made to usually humidify, and is introduced. It may be made to humidify from the same reason also about oxygen or air.
[0004]The hydrogen supplied to the electrode conjugate 1 is hydrogen-ion-ized on the catalyzer electrode (negative electrode) 3, and a hydrogen ion moves toward the catalyzer electrode (anode) 4 side as H^+andxH_2O in the electrolyte 2. In order that a hydrogen ion may move to the anode from a negative electrode with x H_2O at this time, the steam introduced with hydrogen will be gradually penetrated to the anode side along the passage direction of hydrogen, and will approach dry gas.
[0005]The hydrogen ion attained to the carbon electrodes (anode) 6 reacts to the oxygen introduced in the cell proper the same as an oxidizer, generates water, and is discharged with unreacted oxygen. Similarly, the unreacted hydrogen which was not hydrogen-ion-ized is also discharged from a fuel cell body.
[0006]The humidifying system device of the conventional solid polymer electrolyte fuel cell is as being shown in drawing 2. The figure shows hydrogen which is fuel, oxygen (or air) which is oxidizers, and the example which humidified both and was introduced to the fuel cell. Here, as a source of humidifying water, exhaust heat of a fuel cell is collected and the cooling water used as warm water is used. Hydrogen and oxygen (or air) which are introduced to the fuel cell stack 11 are made to contain namely, humidify the steam of the saturated steam partial pressure near a fuel cell operating temperature with the humidifying device 12. Hydrogen and oxygen (or air) which you were made to humidify are distributed to all the electrode conjugate inserted surfaces 13 in the fuel cell stack 11 through the passage groove of the separator 14. 15 in a figure shows a cooling water side.
[0007]

[Problem(s) to be Solved by the Invention]However, the conventional humidifying system device has the following technical problems.
[0008](1) In order to perform humidification of hydrogen used as fuel only at the entrance introduced to a fuel cell, the water vapor content introduced into a fuel cell will be limited to the water vapor content of the saturated steam partial pressure at humidification temperature. Therefore, when it is going to enlarge electrolyte area or electrode conjugate area, The steam which was humidifying hydrogen is gradually penetrated to the oxygen or air side in the form of H^+ and xH_2O, and water vapor pressure becomes low, dry gas is approached, and it becomes impossible to maintain the water retention state of the polymers ion-exchange membrane which is an electrolyte near the passage groove end of hydrogen.
[0009](2) Since distribution supply of the hydrogen which is fuel is carried out at once at all the electrode conjugates, the gas flow rate of the hydrogen supplied to an electrode conjugate becomes very small, and when there are many electrode conjugate sides, it is very difficult [it] to equalize a distributed flow rate.
[0010]While this invention was made in consideration of such a situation and can maintain the water retention state of the polymers ion-exchange membrane which is an electrolyte, It aims at providing the humidifying system device of the fuel cell which enlarges the gas flow rate of the hydrogen supplied to an electrode conjugate, and can perform equipartition in each stack of hydrogen easily.
[0011]
[Means for Solving the Problem]A solid polymer electrolyte fuel cell stack by which this invention was divided into plurality, It is a humidifying system device of a fuel cell humidifying one by one in a process in which it is provided in the upstream of each of said stack, have a humidifying device which humidifies fuel hydrogen, connect said each stack and two or more humidifying devices, and fuel hydrogen is consumed.
[0012]Drawing 3 shows an outline lineblock diagram of a humidifying system device of a fuel cell concerning this invention. 21, 22, and 23 in a figure are the fuel cell stack divided into plurality, and the humidifying device 24 and the humidifying devices (middle) 25 and 26 are arranged at the upstream of these fuel cell stacks 21-23, respectively so that fuel hydrogen introduced to each stacks 21-23 can be humidified one by one. Oxygen or air which is an oxidizer may also be humidified if needed. Here, it is possible to use exhausted cooling water which finished cooling all the stacks which use exhausted cooling water of each stack one by one as ****** of the humidifying devices 24-26.
[0013]
[Function]In the above-mentioned composition, the stack of a solid polymer electrolyte fuel cell is divided, or it connects in series, and fuel is introduced to each stack, humidifying hydrogen one by one,
[0014](1) It becomes possible to always compensate a part for the steam which penetrates the polymers ionic membrane which is an electrolyte in the form of H^+ and xH_2O, and water vapor pressure can be secured near the passage groove end on the separator of hydrogen. Namely, the water retention state of the polymers ion-exchange membrane which is an electrolyte can be maintained now.
[0015](2) A distribution number is enabled to take greatly [it is few and] at things the gas flow rate by which distribution supply is carried out to each electrode conjugate, and equipartition in each stack of hydrogen can be easily performed now.
[0016]
[Example]Hereafter, one example of this invention is described with reference to drawings. In [any] an example, division or the hydrogen line which is fuel in series is connected for a solid polymer electrolyte fuel cell stack, and it shows the example which formed the humidifying device in each stack upper stream.
(Example 1)
[0017]Drawing 4 is referred to. 31 in a figure shows the 1st fuel cell stack, and 32 shows the 2nd fuel cell stack. These fuel cell stacks have two or more laminated separators 33, 34 shows an electrode conjugate inserted surface, and 35 shows a cooling water side. The humidifying device 36 is arranged at the upstream of said 1st fuel cell stack 31, and the middle humidifying device 37 is arranged at the

upstream of the 2nd fuel cell stack 32.
[0018]In the humidifying system device of the fuel cell of such composition, hydrogen and oxygen (or air) which are supplied to the 1st fuel cell stack 31 are humidified with the cooling water used as **** discharged from the 2nd fuel cell stack 32, and are introduced into the 1st fuel cell stack 31. The hydrogen which is discharged from the 1st fuel cell stack 31 and which remained, and oxygen (or air) are humidified with the cooling water used as **** discharged from the 1st fuel cell stack 31, and are introduced into the 2nd fuel cell stack 32.
(Example 2) Drawing 5 is referred to. However, drawing 4 and the member attach a same sign, and omit explanation.
[0019]Hydrogen and oxygen (or air) which are supplied to the 1st fuel cell stack 31 are humidified with the cooling water used as **** which cools the 1st fuel cell stack 31 and 2nd fuel cell stack 32, and is discharged, and are introduced into the 1st fuel cell stack 31. Hydrogen and oxygen (or air) which are discharged from the 1st fuel cell stack 31 and which remained are humidified with the cooling water used as **** which cools the 1st fuel cell stack 31 and 2nd fuel cell stack 32, and is discharged, and are introduced into the 2nd fuel cell stack 32.
(Example 3) Drawing 6 is referred to. However, drawing 4 and the member attach a same sign, and omit explanation. This Example 3 makes it a gist to branch to each stack from the start and to have supplied oxygen or air which is an oxidizer to it in drawing 4.

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TECHNICAL FIELD

[Industrial Application]This invention relates to the humidifying system device of the fuel cell which consists of the fuel cell stack and humidifying device of a solid polymer electrolyte fuel cell.

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PRIOR ART

[Description of the Prior Art]Like common knowledge, the power generation principle of a solid polymer electrolyte fuel cell is as being shown in drawing 1. The electrode conjugate 1 as the electrolyte (polymers ion-exchange membrane) 2 The polymers ion-exchange membrane of a fluoro-resin system. (For example, a fluoro-resin system ion-exchange membrane with a sulfonic group) is used, Carry out this in the center, the catalyzer electrode (negative electrode) 3 and the catalyzer electrode (anode) 4 which consist of platinum are made to adhere to both sides, and it has composition further repeated to sandwich shape across the both sides with the PORASU carbon electrodes (negative electrode) 5 and the carbon electrodes (anode) 6.
[0003]In order to give the hydrogen ion permeability of the polymers ion-exchange membrane which is the electrolyte 2, the hydrogen introduced by the circulating groove of the separator 7 in a fuel cell body makes the steam of the saturated steam partial pressure in near the operating temperature of a fuel cell contain before introduction, namely, is made to usually humidify, and is introduced. It may be made to humidify from the same reason also about oxygen or air.
[0004]The hydrogen supplied to the electrode conjugate 1 is hydrogen-ion-ized on the catalyzer electrode (negative electrode) 3, and a hydrogen ion moves toward the catalyzer electrode (anode) 4 side as H^+andxH_2O in the electrolyte 2. In order that a hydrogen ion may move to the anode from a negative electrode with x H_2O at this time, the steam introduced with hydrogen will be gradually penetrated to the anode side along the passage direction of hydrogen, and will approach dry gas.
[0005]The hydrogen ion attained to the carbon electrodes (anode) 6 reacts to the oxygen introduced in the cell proper the same as an oxidizer, generates water, and is discharged with unreacted oxygen. Similarly, the unreacted hydrogen which was not hydrogen-ion-ized is also discharged from a fuel cell body.
[0006]The humidifying system device of the conventional solid polymer electrolyte fuel cell is as being shown in drawing 2. The figure shows hydrogen which is fuel, oxygen (or air) which is oxidizers, and the example which humidified both and was introduced to the fuel cell. Here, as a source of humidifying water, exhaust heat of a fuel cell is collected and the cooling water used as warm water is used. Hydrogen and oxygen (or air) which are introduced to the fuel cell stack 11 are made to contain namely, humidify the steam of the saturated steam partial pressure near a fuel cell operating temperature with the humidifying device 12. Hydrogen and oxygen (or air) which you were made to humidify are distributed to all the electrode conjugate inserted surfaces 13 in the fuel cell stack 11 through the passage groove of the separator 14. 15 in a figure shows a cooling water side.

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EFFECT OF THE INVENTION

[Effect of the Invention]As explained in full detail above, while the water retention state of the polymers ion-exchange membrane which is an electrolyte is maintainable according to this invention, the humidifying system device of the fuel cell which enlarges the gas flow rate of the hydrogen supplied to an electrode conjugate, and can perform equipartition in each stack of hydrogen easily can be provided.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]However, the conventional humidifying system device has the following technical problems.
[0008](1) In order to perform humidification of hydrogen used as fuel only at the entrance introduced to a fuel cell, the water vapor content introduced into a fuel cell will be limited to the water vapor content of the saturated steam partial pressure at humidification temperature. Therefore, when it is going to enlarge electrolyte area or electrode conjugate area, The steam which was humidifying hydrogen is gradually penetrated to the oxygen or air side in the form of H^+ and xH_2O, and water vapor pressure becomes low, dry gas is approached, and it becomes impossible to maintain the water retention state of the polymers ion-exchange membrane which is an electrolyte near the passage groove end of hydrogen.
[0009](2) Since distribution supply of the hydrogen which is fuel is carried out at once at all the electrode conjugates, the gas flow rate of the hydrogen supplied to an electrode conjugate becomes very small, and when there are many electrode conjugate sides, it is very difficult [it] to equalize a distributed flow rate.
[0010]While this invention was made in consideration of such a situation and can maintain the water retention state of the polymers ion-exchange membrane which is an electrolyte, It aims at providing the humidifying system device of the fuel cell which enlarges the gas flow rate of the hydrogen supplied to an electrode conjugate, and can perform equipartition in each stack of hydrogen easily.

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MEANS

[Means for Solving the Problem]A solid polymer electrolyte fuel cell stack by which this invention was divided into plurality, It is a humidifying system device of a fuel cell humidifying one by one in a process in which it is provided in the upstream of each of said stack, have a humidifying device which humidifies fuel hydrogen, connect said each stack and two or more humidifying devices, and fuel hydrogen is consumed.

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OPERATION

[Function]In the above-mentioned composition, the stack of a solid polymer electrolyte fuel cell is divided, or it connects in series, and fuel is introduced to each stack, humidifying hydrogen one by one,
[0014](1) It becomes possible to always compensate a part for the steam which penetrates the polymers ionic membrane which is an electrolyte in the form of H^+ and xH_2O, and water vapor pressure can be secured near the passage groove end on the separator of hydrogen. Namely, the water retention state of the polymers ion-exchange membrane which is an electrolyte can be maintained now.
[0015](2) A distribution number is enabled to take greatly [it is few and] at things the gas flow rate by which distribution supply is carried out to each electrode conjugate, and equipartition in each stack of hydrogen can be easily performed now.

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EXAMPLE

[Example]Hereafter, one example of this invention is described with reference to drawings. In [any] an example, division or the hydrogen line which is fuel in series is connected for a solid polymer electrolyte fuel cell stack, and it shows the example which formed the humidifying device in each stack upper stream.
(Example 1)
[0017]Drawing 4 is referred to. 31 in a figure shows the 1st fuel cell stack, and 32 shows the 2nd fuel cell stack. These fuel cell stacks have two or more laminated separators 33, 34 shows an electrode conjugate inserted surface, and 35 shows a cooling water side. The humidifying device 36 is arranged at the upstream of said 1st fuel cell stack 31, and the middle humidifying device 37 is arranged at the upstream of the 2nd fuel cell stack 32.
[0018]In the humidifying system device of the fuel cell of such composition, hydrogen and oxygen (or air) which are supplied to the 1st fuel cell stack 31 are humidified with the cooling water used as **** discharged from the 2nd fuel cell stack 32, and are introduced into the 1st fuel cell stack 31. The hydrogen which is discharged from the 1st fuel cell stack 31 and which remained, and oxygen (or air) are humidified with the cooling water used as **** discharged from the 1st fuel cell stack 31, and are introduced into the 2nd fuel cell stack 32.
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[0019]Hydrogen and oxygen (or air) which are supplied to the 1st fuel cell stack 31 are humidified with the cooling water used as **** which cools the 1st fuel cell stack 31 and 2nd fuel cell stack 32, and is discharged, and are introduced into the 1st fuel cell stack 31. Hydrogen and oxygen (or air) which are discharged from the 1st fuel cell stack 31 and which remained are humidified with the cooling water used as **** which cools the 1st fuel cell stack 31 and 2nd fuel cell stack 32, and is discharged, and are introduced into the 2nd fuel cell stack 32.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The explanatory view showing the power generation principle of a solid polymer electrolyte fuel cell.
[Drawing 2]The explanatory view of the humidifying system device of the conventional fuel cell.
[Drawing 3]The outline lineblock diagram of the humidifying system device of the fuel cell concerning this invention.
[Drawing 4]The explanatory view of the humidifying system device of the fuel cell concerning Example 1 of this invention.
[Drawing 5]The explanatory view of the humidifying system device of the fuel cell concerning Example 2 of this invention.
[Drawing 6]The explanatory view of the humidifying system device of the fuel cell concerning Example 3 of this invention.
[Drawing 7]The explanatory view of the humidifying system device of the fuel cell concerning Example 4 of this invention.
[Description of Notations]
31 [-- A humidifying device, 37 / -- Middle humidifying device.] -- The 1st fuel cell stack and 32 -- The 2nd fuel cell stack, 33 -- A separator and 36

[Translation done.]